



Lunch & Learn Open Science

CSZ: Citizen Science, Co-creation, and the SDGs

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Mercator
Foundation
Switzerland

What is CS?



● Citizen Science (CS)

The involvement of non-professional scientists (“Citizens”) in scientific research.

Including by:

- *asking research questions*
- *collecting data*
- *analysis data*
- *analysing and applying results*

(also known as “community science”, “participative research”, ...)

As with other forms of scientific research, citizen science is a **multi-disciplinary** and increasingly a **trans-disciplinary** practice.



CS vs CROWDSOURCING

Emphasis on scientific research!

- CS projects seek to **generate new knowledge**
- Include engagement of “non-scientist” participant in (quantitative or qualitative) **data collection, processing or analysis**
- CS projects are **mutually beneficial** for both professional and volunteer scientist participants*



* Different from “extractive” forms of scientific research involving the public, e.g. questionnaires or interviews are hardly CS ... participants are passive - do not engage in research ‘work’ but are the subjects of research.

● A bit of history ...

A new name for an old concept

- **1800** Thomas Jefferson started the first network of **volunteer weather observers**
- **1860** Charles Darwin sought out information from an army of almost **2000 correspondents** for his theories of evolution
- **1900** start of National Audubon Society's **Christmas Bird Count** (ongoing!)



● A bit of history ...



1990

2000

...

GROWING IN IMPORTANCE AS
OF 1990

- Increase in education level in the general population
- Increased leisure time
- Technology: low-cost computing devices, internet access, mobile devices , ...
- “Culture of sharing” (open movement – the idea of having open data, software and hardware)



Examples

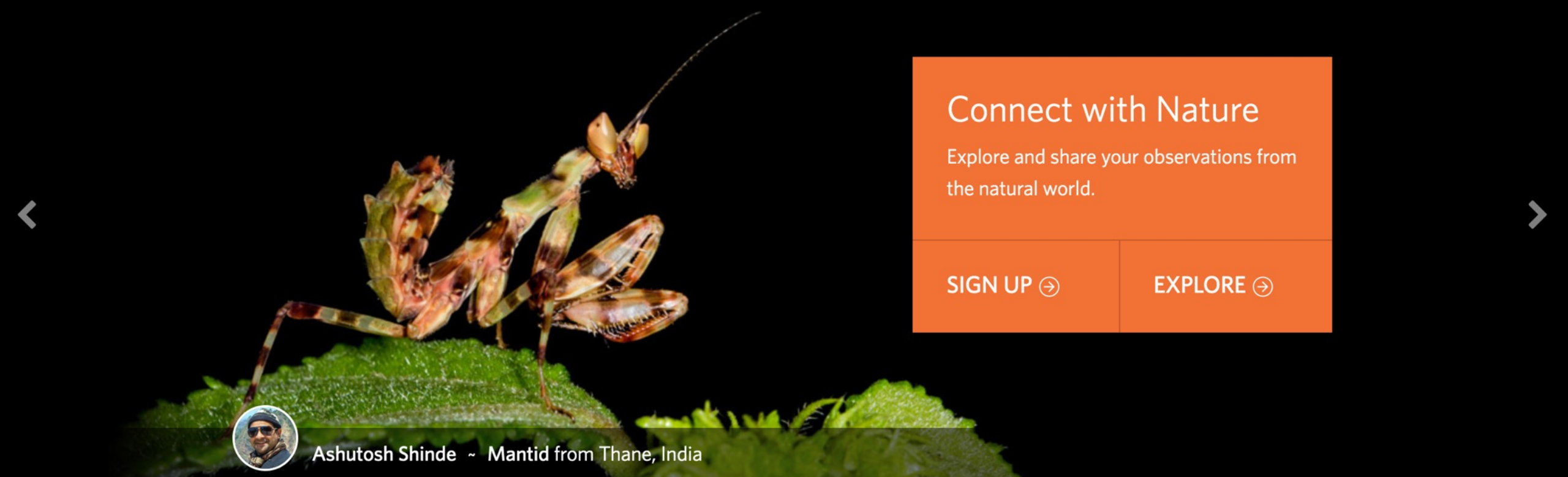


● Participants' Role/Contribution

DATA COLLECTION

Active or passive data collection


(images, descriptions, samples, personal digital data, etc.)




Connect with Nature

Explore and share your observations from the natural world.


[SIGN UP](#) [EXPLORE](#)

 CALIFORNIA ACADEMY OF SCIENCES  NATIONAL GEOGRAPHIC


iNaturalist is a joint initiative of the California Academy of Sciences and the National Geographic Society.

 **293,699**
Species Observed

[SIGN UP](#) [LEARN](#)

 **48,232,527**
Observations to Date

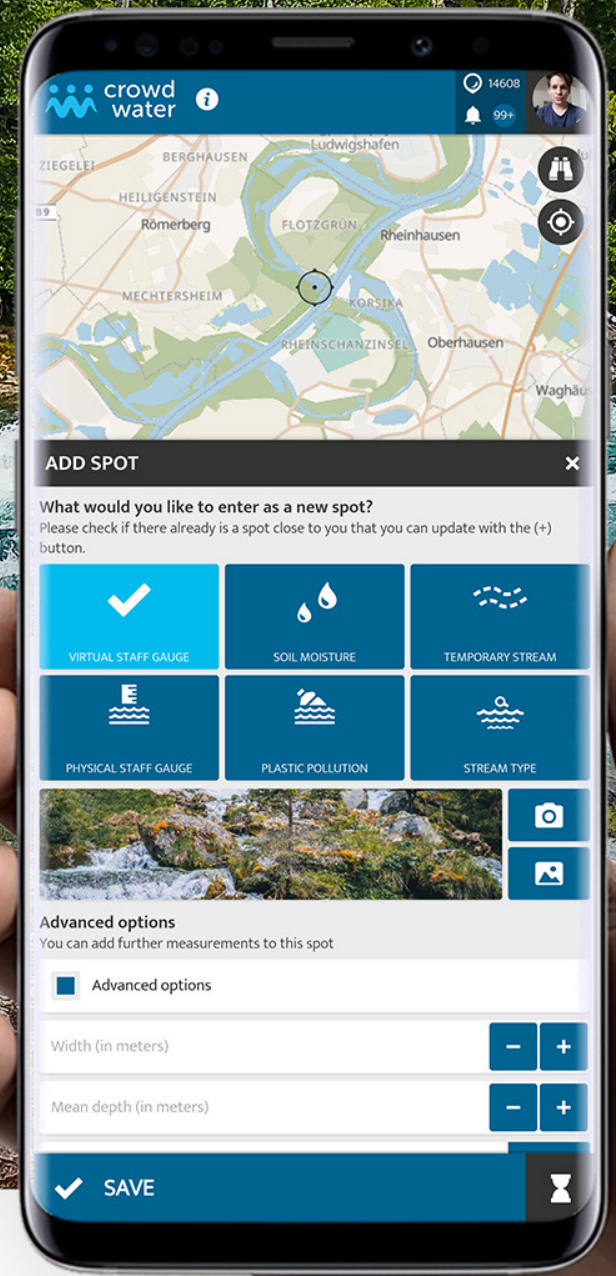
[SIGN UP](#) [EXPLORE](#)

 **3,074,281**
People Signed Up

[SIGN UP](#) [MEET](#)



crowd water



A new alliance between citizen-science organizations and UNEP to escalate the global fight against mosquito-borne diseases



Global Mosquito Alert.

A new citizen science initiative that is leveraging networks of scientists and volunteers for the global surveillance and control of disease-vector mosquitoes.

[Learn more](#)



Citizens measure the air quality near their own house by installing a simple, standardized measurement device - nitrogen dioxide (NO₂) - on a street-facing window



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DATA ANALYSIS

Tasks unsuitable or extremely difficult for computers – on web

(image analysis, pattern recognition, text transcription, mapping)



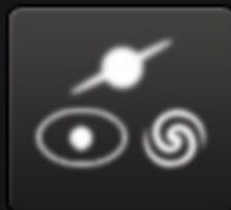
Classify galaxies

Answer the question below using the buttons provided.

Is the galaxy simply smooth and rounded, with no sign of a disk?



Smooth

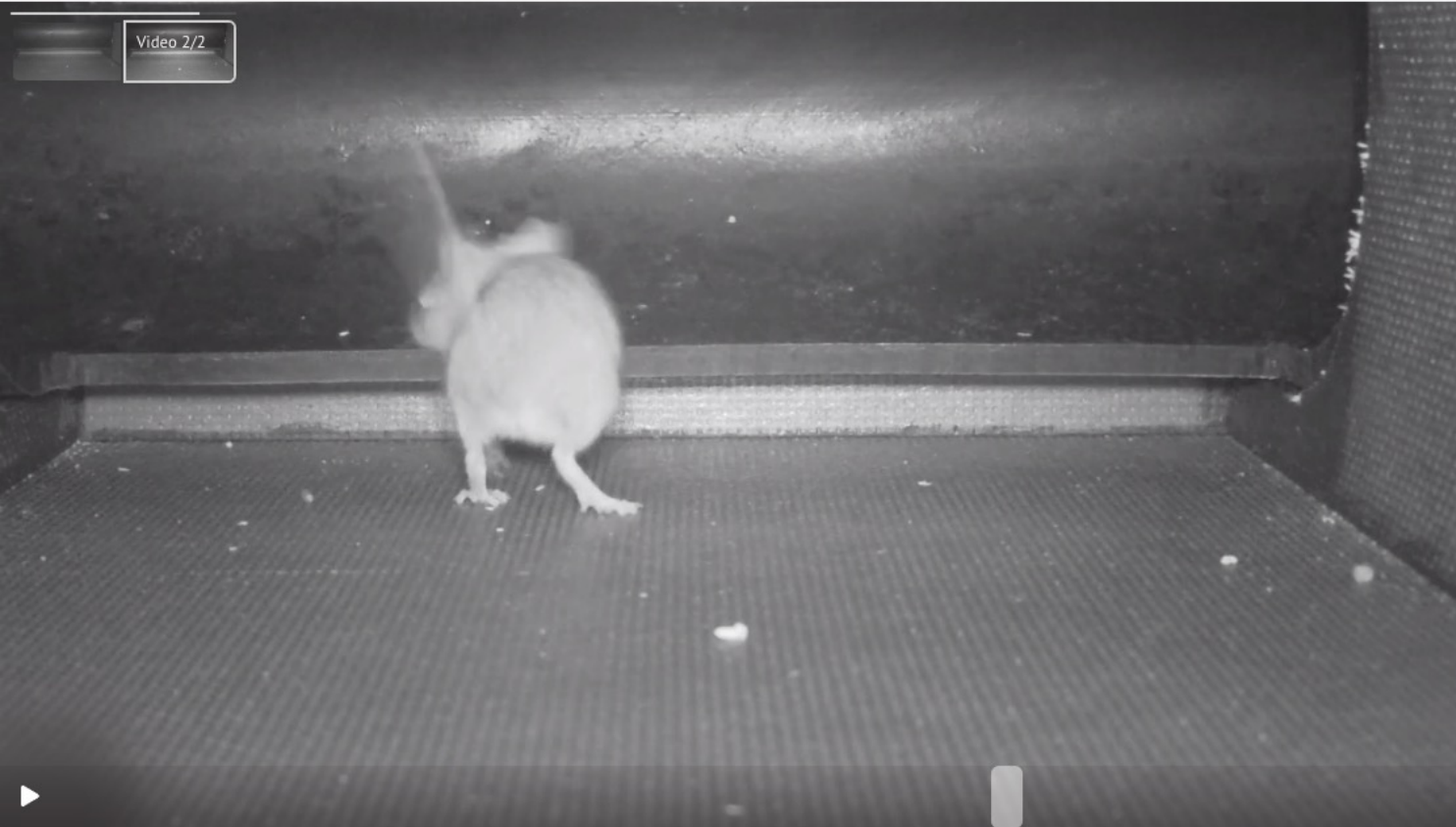


Features or disk



Star or artifact

Which Animal do You See?



NO ANIMAL RECOGNIZABLE



Source: Twitter

What Snake is This?

Family, Genus, Binomial or Common Name

no snake / multiple species visible

SKIP

SUBMIT

SEND FEEDBACK ON THIS IMAGE



Aktuell:
Lesen Sie den neuen Blog-
Beitrag zum Wenker-Projekt

ZUM BLOG

SWISS GERMAN 1930 / 2020

FIND YOUR OWN DIALECT IN THE
40 WENKER PHRASES.

TRANSCRIBE

TRANSLATE

A joint initiative by



**University of
Zurich** UZH

ETH zürich





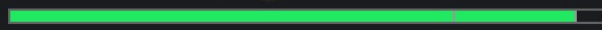
OVERVIEW



Start Playing

Starburst Neuron

change cell



Mapping the 3D structure of neurons branches and advancing the quest to UNDERSTAND HUMAN BRAIN

Notable Eyewirers

today week mon

rank	username	points
1	ossomasticato	11003
2	jaro87	8313
3	dereks	5830
4	MollyH	5616
5	hongcwoo	3772
6	joegueboe	2866
7	bl4ckscor3	2723
8	cognaso	2722
9	Tsumi	1758
10	onceamicrobe	1594
11	Vinara	1330



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COMPUTING POWER


(Citizen Cyberscience)
Spare computing power for modelling and simulations

(time and CPU intensive simulations)



LHC@home Test4Theory

This WebGL demo is built using the Google Chrome Globe WebGL experiment from Google Data Arts Team (you can zoom in using the wheel of your mouse!). The globe shows the volunteers in the last 24 hours contributing to the LHC@Home CERN Test4Theory project.

Play/Pause the rotation 



Help CERN physicists

- calibrate searches for particles
- fine-tune the machines and beam dynamics
- contribute to building new theories on dark matter
- create simulations of antimatter and new phenomena never-before-seen

● Computing Power?

Artificial Intelligence requires staggering amounts of computing power (and electricity) to devise and train algorithms

~ 15 billion personal mobile devices (2021)

~ 200 billion CPU cores running in the world

*“ The computational power used for AI training has **doubled every 3.4 months** since 2012, a staggering **35x increase** compared to the traditional Moore's Law trajectory”*

(OpenAI Study - Apr 2023)



Co-Creation





Level of Collaboration/Engagement

Setting research
questions

Developing methods
and material

Collecting/
processign data

Analysing data

Sharing results

Stages of scientific research process

CONTRIBUTORY CS Projects



COLLABORATIVE CS Projects



CO-CREATED CS Projects



Why Co-Creation?

- Co-creation in CS plays an important role in the **democratization of research**.
- In the co-creation process a **diversity of actors** translate their different **values, interests**, and **perspectives** into **common research goals and processes**.
- **Complementary knowledge** and **skills** (and resources) produce **innovative** ideas and solutions.
- The process generates **shared ownership & values**.
- Co-creation elicit a **wider social impact** and affect **education, public engagement, social well-being** and **motivational** dimensions of participants.



● Benefits for Scientists

Resource efficiency of research activities

- greater spatial resolution & denser and more abundant observations, including data from remote and hard to reach locations
- Increased temporal resolution and coverage (high frequencies data collection)

Opportunity to widen dissemination and impact of their work

New perspectives on topics (including new discoveries!)



Citizens' Motivations

- Personal satisfaction from contributing to science and to the wider public good
- Personal development and opportunity to gain new knowledge and skills
- Opportunity to establish connections with similarly minded people
- Personal enjoyment (fun!) from participating in enriching activities

Motivational Factors

Mean score (1= unimportant; 5= very important)

n=1060

Proportion

Interest in theme and topic

4.6

Contributing to scientific research

4.3

The project's values or goals

4.2

Opportunities to learn

4.2

Desire to help

4

Opportunities to learn existing knowledge with others

4

Fun and enjoyment

3.9

Opportunity for personal Growth

3.8

Meeting new people and engaging in a community

3.2

Social reasons or recognition

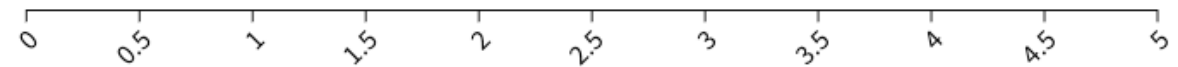
2.5

Potential benefit for my career

2.2

Rewards (e.g. money, certificates of participation, points in a game)

1.6



CS DATA

CS contribution to:

- civic engagement
- societal goals (i.e. environmental justice)



WIDELY RECOGNIZED

Critical importance of data as:

- an output of CS projects
- a long-lived legacy of CS activities
- an important contribution to scientific research



LESS UNDERSTOOD

CS data: used extensively in studies of **biodiversity** and **pollution**; crowdsourced data are being used by UN for **humanitarian activities**; citizen scientists are providing data relevant to **monitoring** the sustainable development goals (**SDGs**).



Citizen Science & SDGs



The Sustainable Development Goals Report 2023

“Unless we act now, the 2030 Agenda will become an epitaph for a world that might have been.”

10 July 2023

António Guterres

Secretary-General, United Nations

COVID-19 PANDEMIC	significant reversals in global health outcomes, including largest decline in three decades childhood vaccinations, increase of tuberculosis and malaria deaths + devastating impacts on education
CLIMATE CHANGE	climate crisis is worsening - global temperature already 1.1 °C above pre-industrial levels - likely to reach critical 1.5 °C tipping point by 2035. Catastrophic and intensifying heat waves, droughts, flooding and wildfires - Rising sea levels
BIODIVERSITY LOSS	Facing the largest species extinction event since the dinosaur age
POLLUTION	over 17 million metric tons of plastic pollution in oceans in 2021, with projections doubling or tripling by 2040.
RUSSIA INVASION OF UKRAINE	110 million displaced people, human rights violations + increases in the prices of food and energy creating a global cost-of-living crisis affecting billions of people.

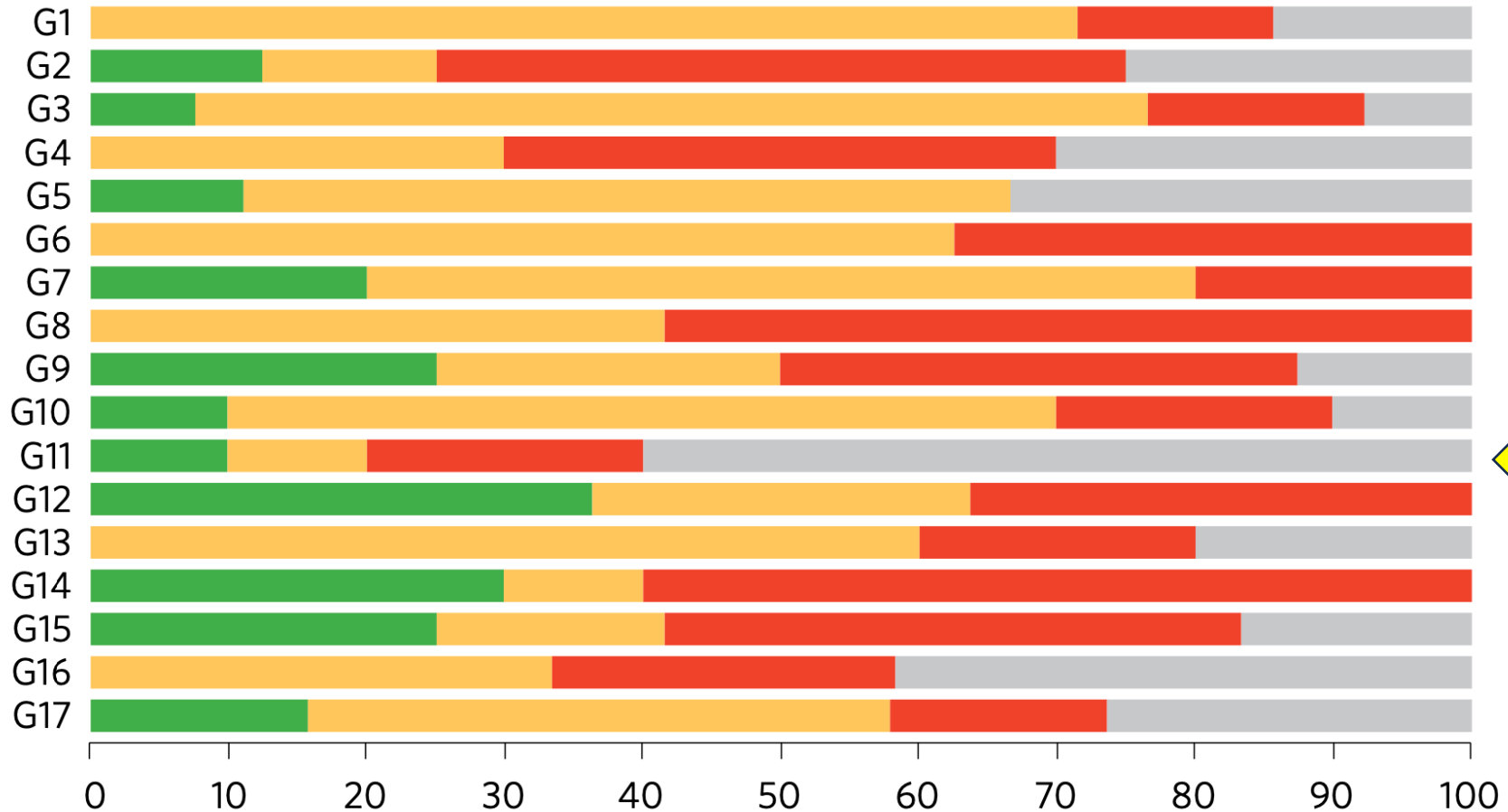
> 50 % of targets → progress weak and insufficient

~ 30 % of targets → progress stalled or gone into reverse



SDG STATUS

Progress assessment for the 17 Goals based on assessed targets, 2023 or latest data (percentage)



Goal 11 -
Sustainable cities
and communities

- On track or target met
- Fair progress, but acceleration needed
- Stagnation or regression
- Insufficient data

Current Contributions

CS is already contributing: **5 indicators**

Indicator 9.1.1 Proportion of the rural population who live within 2 km of an all-season road
(OpenStreetMap)

Indicator 14.1.1 Index of coastal eutrophication and floating plastic debris density

Indicators 15.1.2 Proportion of important sites for terrestrial and freshwater biodiversity that are covered by protected areas, by ecosystem type

15.4.1 Coverage by protected areas of important sites for mountain biodiversity

Indicator 15.5.1 Red List Index

About
33%

Could contribute: **76 indicators**

Greatest inputs:

SDG 15 Life on Land

SDG 11 Sustainable Cities and Communities

SDG 3 Good Health and Wellbeing

SDG 6 Clean Water and Sanitation



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Stiftung
Mercator
Schweiz

CITIZEN SCIENCE ZURICH

- CSZ provides **comprehensive support to researchers and citizens in designing, planning and implementing CS projects.** This covers theoretical, practical, and ethical support, including methodological guidelines and standards.
- CSZ mission is to **inspire** and **support** people to **engage in different forms of participatory research**, enabling an effective collaboration between science and society.



University of
Zurich^{UZH}

ETH zürich

supported by Mercator Foundation Switzerland

What we provide

- **COMPREHENSIVE SUPPORT**

To researchers and citizens in designing, planning and implementing CS projects. This covers theoretical, practical, and ethical support, including methodological guidelines and standards.

- **DIGITAL TOOLS**

A set of tools that make it easy to create new CS projects, or contribute to existing ones:

- The CS Project Builder to create digital data analysis projects with a simple step-by-step process.
- The CS logger to create digital data collection projects in the form of smartphone Apps.

- **TRAINING**

A variety of trainings for students, researchers, citizens, and practitioners such as staff of museums, archives, libraries and science centers.

- **GRANTS**

Yearly Seed Grants for projects, funded by Mercator Foundation.

- **NETWORK & PARTNERSHIPS**

CSZ builds bridges between researchers and practitioners in Switzerland and beyond, allowing practitioners in Zurich to both share and acquire knowledge and expertise, and to join forces nationally and internationally.



**CITIZEN
SCIENCE
ZURICH**

Thank you!

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